European Expert Recommendations on the Use of Injectable Poly-L-Lactic Acid for Facial Rejuvenation

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ABSTRACT

Over the last few years, there have been a number of important changes in how we appreciate and understand the aging face. Volume loss is now recognized as a major component of facial aging. Treatment options that replace lost volume are increasingly used for recontouring and rejuvenation of the aging face. In this review we present and discuss the European Expert Group recommendations on the ideal use of the unique collagen stimulator, poly-L-lactic acid (PLLA, Sculptra®, Sinclair Pharmaceuticals) for facial rejuvenation lasting up to 25 months. Optimal results are achieved based on a detailed knowledge of facial anatomy, correct treatment procedure, specifically the right dilution, the correct injection technique, as well as appropriate patient aftercare. PLLA is an effective and safe collagen stimulator that treats the whole face. PLLA is simple to use, provides the foundation for facial rejuvenation, is easy to combine with other treatments, and gives long-lasting effects with a high level of patient satisfaction.

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INTRODUCTION

Facial aging is no longer considered purely gravitational decent. Volume loss, a dynamic process with skin thinning and collagen loss, fat redistribution, muscle atrophy and bone remodeling, is a major component.[1-3] While surgery can address lax or sagging skin, or the need to tighten or resuspend facial muscle, it does not address volume loss without fat grafting, or treat the face as a whole.

Treatment options such as poly-L-lactic acid (PLLA, Sculptra®, Sinclair Pharmaceuticals) that replace volume by considering the entire face and its structural foundation provide a more holistic approach, may forestall further deterioration, and avoid/postpone need for surgery.[1,2,4]

The Dynamic Process of Facial Aging

Multiple changes in skin, subcutaneous fat, muscle and bone contribute to facial aging.[5-7] As facial aging primarily comprises soft-tissue changes, bone atrophy and remodeling,[2,8-10] evaluating the whole face and structural tissue integrity is pivotal to provide natural-looking results.

Bone

Craniofacial skeletal remodeling, with expansion and loss of bone, is an important contributor to facial aging.[4,11-25] By the age of sixty, 25% of bone mass is lost,[26] with increases in orbital aperture; decreases in glabellar, pyriform, and maxillary angles.[11] Mandibular angle changes may cause blunting or loss of lower facial border definition;[4] pyriform aperture increases the appearance of nose elongation and drooping nasal tip.[16] Midfacial bone loss may exacerbate the nasolabial fold by reorienting the malar fat pad medially and inferiorly.[22]

Fat

Changes in fat contribute to facial aging.[27,28] Fat pad compartments are located in two layers: a superficial layer between the dermis and fascia superficialis contributing to a healthy looking face, and a deep layer around or under the muscles, contributing to a youthful appearance.[29] Age-related changes in volume and positioning lead to changes in facial appearance.[30,31] Fat redistribution causes atrophy in certain areas (ie, periorbital, forehead, buccal, temporal, and perioral areas) and hypertrophy in others.[5] Fat pads become more discernible as separate entities, as do many underlying facial structures, such as submaxillary glands and bony protuberances.[32] The malar fat pad gradually slides forward and down to bulge against the nasolabial crease, giving nasal fold prominence. Fat redistribution and demarcation may disturb a smooth transition from one anatomical region to another, giving an unbalanced appearance. Sagging (jowl, submental area, and nasolabial fold) becomes pronounced due to relative excess of skin and/or lack of elastic recoil and fat accumulation.[32]

Muscles

It is unclear whether muscles age histologically, or change physiologically in response to the aging process of underlying

structures. It has been suggested in a youthful face, deep fat beneath the muscle is responsible for its curvilinear contour presenting an anterior surface convexity.[32] Loss of volume beneath the muscles causes structures to gradually shorten and straighten, taking on a more rigid appearance.

Skin

As skin ages there is fragmentation of the dermal collagen matrix, loss of structural integrity, and fibroblast function impairment,[33] due to actions of specific matrix metalloproteinases.[34] Fibroblasts can no longer attach to these fragmented collagen fibers, subsequently collapse producing low levels of collagen and high levels of collagen-degrading enzymes. Once critical amounts of collagen are lost this imbalance advances the aging process, resulting in dynamic and static wrinkles, dermal atrophy, and elastosis.[35]

Facial Aesthetic Assessment and Areas of PLLA Use

Facial aging influences shape, proportions, and topography: the face loses volume; the skin elasticity and can no longer accommodate underlying volume loss, causing sagging and folding. Atrophic areas can be revealed with palpation. The orbit shape, bony support under the brow and nose, proportions of the lower third of the face, and perioral ratio are all-important considerations.

Fat atrophy becomes clinically apparent in the temple and cheek, then the chin and mandibular areas. Facial features become concave, characterized by thin lips, sunken temple and cheek, scalloped mandible, and increased facial shadowing. The most significant change is excess skin sagging caused by conversion of primary arcs to straight lines.[36,37] Fat accumulation pulls the encumbered skin downwards under gravitational force, whereas fat loss leaves excessive skin in proportion to diminished volume, causing sagging.[5]

Male and female patients can both benefit from treatment. Although their faces share many common features; there are morphological gender differences.[38,39]

PLLA can address volume loss providing the foundation for facial rejuvenation. Ideal patients have realistic treatment goals, appreciate the need for full-face volume restoration, understand the delayed treatment effects of PLLA, and need for multiple treatment sessions.[40] Areas of PLLA use - malar area, cheeks, jawline, and temples - as well where PLLA should not be used are shown in Table 1.

PLLA can also be used in others indications like acne scars[41,42] and décolleté.[43]

Mode of Action, Safety, and Efficacy of PLLA

PLLA is considered a deep tissue regenerator, providing soft tissue augmentation through stimulation of collagen synthesis. A statistically significant 33.7% increase in mean level of type I collagen was reported 6 months after PLLA injection (P=0.03). Increases in type I and type III collagen were seen in 79% and 72% of patients, respectively.[44] PLLA behaves entirely differently to traditional injectable fillers and fat injections, generating new volume in a gradual, progressive manner through fibroblast stimulation leading to new collagen deposition,[45] with results lasting up to 25 months.[46,47]

Efficacy

A randomized, evaluator-blinded, parallel-group, multicentre study, evaluated the safety and efficacy of PLLA compared to human collagen in 233 patients treated for nasolabial fold wrinkles. Efficacy was assessed using a 6-point wrinkle assessment scale (WAS).[48]

PLLA was reconstituted with 5mL SWFI, two hours before injection and injected (0.1-0.2mL per session) deep into the dermis using a cross-hatching technique. Patients had 1-4 sessions at 3-week intervals between sessions until optimal correction (WAS= 1 or 0).

PLLA significantly improved mean WAS at all time points (P<0.001, Figure 1).[48] Twenty-five months after the first injection of PLLA, 81% of patients showed a 'normal' or 'excellent' global improvement; 80% reported 'good' or 'excellent' results in terms of subject satisfaction;[49] and investigators reported 'superior improvement' in 86% of patients.[50]

In addition to this pivotal trial, numerous studies have been conducted confirming the efficacy of PLLA.[7,42-46,51-59] High patient satisfaction was reported, dependent on the area treated, when assessments were made, and number of treatment sessions.[45,51-60]

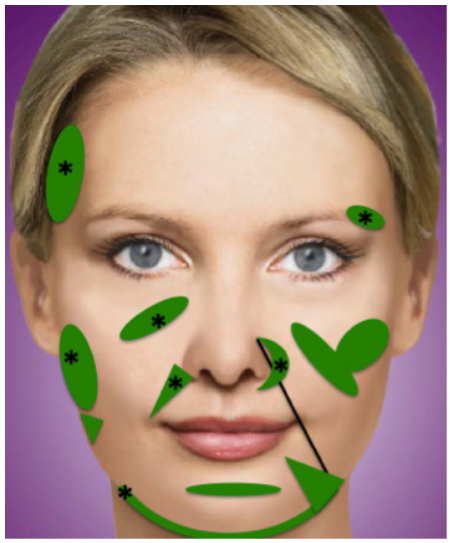
The largest efficacy study in Europe involved 2131 patients and 7185 treatment sessions with PLLA,[45] 95.9% seeking cosmetic augmentation. Ninety-five percent of patients were satisfied with their cosmetic results.[45] In another large retrospective European case review of 568 cosmetic patients, patient and physician satisfaction (on a scale of 1-10) averaged 7.6 (range 6.3-8.4 depending on area treated).[52] In a retrospective review of 221 patients, 72% stated they would plan future PLLA injections, and 14% 'possibly', if needed.[53]

In a study of 36 patients with varying degrees of cutaneous aging in the neck and chest (presternal area) treated with PLLA, 92% indicated they were pleased with the results and would choose to do it again. Those treated in the presternal region reported optimal improvement and high satisfaction.[59]

A study in 230 HIV patients treated for facial lipoatrophy reported improvements in quality of life and patient satisfaction maintained for 12-18 months post-treatment.[61]

TABLE 1.

European Expert Group Recommendations on the Areas of Use of PLLA

Recommendation		Areas of Use
PLLA is ideal for use in these areas (marked in green)		Malar area Cheeks Pre-auricular area Prejowl sulcus Chin area along the mandibular border Medial from the DAO muscle to address part of the mental fold Deep to the DAO and Mentalis muscles
PLLA can be used in these areas ensuring special attention to the anatomy (marked in green with asterisks)	*areas where anatomy is important	Temples (injection either deep under the temporalis muscle and close to the bone, reflux to avoid intravascular injection) Submalar region of the zygomatic bone (do not inject in the tear trough itself) Nasolabial crease keeping injections subdermal, or deep (supraperiostal) around the pyriform aperture (reflux and inject slowly) Recontouring of the lateral 1/3 of the mandible/ mandibular angle (inject subcutaneously above the masseter muscle and parotid gland) Mediojugal fold
PLLA should not be used in these areas (marked in red)		Subdermally such as eyelid/crow's feet In hyperdynamic areas such as depressor anguli oris muscle, commissures, perioral area including upper lip perioral lines and periorbital area Red of the lips Front head lines and vermillion border of the lip to avoid nodularity irregular collagen formation Nose

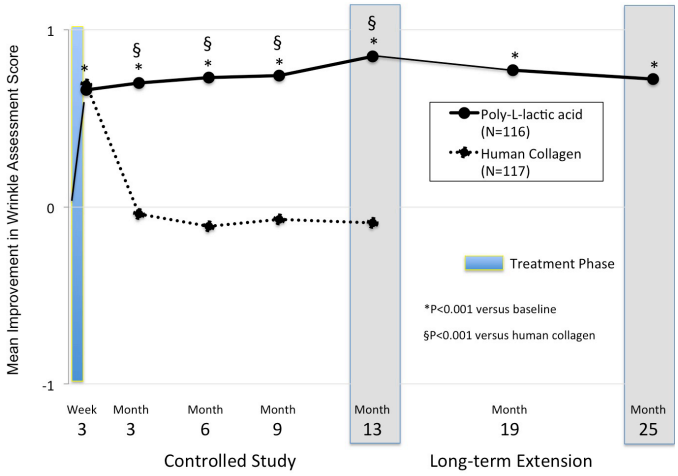
Safety

The safety and efficacy of PLLA for soft-tissue augmentation are well established,[45] with over 20 studies in more than 4,000 patients. However, in common with injectable fillers, some side effects have been reported with PLLA. Immediate effects are mild and generally disappear spontaneously. Delayed effects include nonvisible palpable nodules and visible papules.

The observed papules are typically palpable, asymptomatic, and nonvisible with 95% resolving on their own. In the pivotal PLLA study deep dermal injection (final reconstitution volume 5mL) with treatments 3 weeks apart resulted in 8.6% injection-site papules (<5 mm) and 6.9% nodules (>5 mm). These were mild to moderate, most resolving without treatment. During the follow-up period, nodule and papule incidence decreased to 0.9% and 1.9%, respectively.[48] No severe granulomatous response was reported.[48]

Papules were mostly seen in the early days of PLLA use, investigators reporting decreases in papule formation with increased experience and methodology changes. One group treated 300 patients with PLLA, initially reconstituted in 3mL SWFI and hydrated 2-12 hours before injection. Ten percent of patients developed subcutaneous papules,[62] the majority resolving in 12-24 months. Three important modifications were made: hydration

FIGURE 1. Change in Evaluator Wrinkle Assessment Score Up to 25 months.



time increased to 36-48 hours, 2mL lidocaine added immediately before injection (giving a final dilution of 5mL), and PLLA injected into the uppermost portion of the subcutaneous fat. The incidence of subcutaneous papules reduced dramatically to <1%.[62] A second group injected 3,000 patients with PLLA from 1999 to 2006. Initially, a 3mL dilution was used with a 1% incidence of late-onset nodules. Dilutions of 5mL, and occasionally 7mL or more, reduced the incidence to 0.13%. Other variables, including injection frequency remained unchanged.[63] The Injectable Filler Safety (IFS) study group monitored adverse events and risk factors with PLLA over an 8-year period. Adverse events frequency decreased significantly following new dilution recommendations (from 3mL to 5mL) in 2004.[64]

Optimal Use of PLLA for Facial Rejuvenation: Expert Recommendations on Product Reconstitution and Injection Techniques

In 1999, PLLA was approved in Europe for increasing the volume of depressed areas. Initial recommendations advised the lyophilized powder be reconstituted in ≤3 mL SWFI 2 hours prior to injection, with a short treatment interval (7-10 days) between sessions; all proving sub-optimal. In addition, injections were too superficial; made into hyperdynamic facial areas such as the hypermobile perioral and periocular regions with risk of the injected material coalescing.

Coinciding with expanded PLLA use to include large volume correction in 2004, methodology changes were adopted across Europe. Dilution was increased to ≥5mL, hydration overnight, injecting in the dermis avoided, treatment intervals increased to 4-6 weeks, and post-treatment massage introduced. Incidence of injection site adverse events decreased significantly.

PLLA is very easy to use, gives natural results and offers unique advantages over other products providing deep tissue regeneration. Recommendations in Table 2 on the preparation and use of PLLA are based on an extensive review of the literature and collective expert experience gained through many years' use.

Adequate dilution and hydration are key. A total volume of 9mL (7mL of SWFI and 2mL anesthetic [lidocaine or mepivacaine]) just prior the injection is recommended for facial aesthetic treatment; based on treating the whole face with both subcutaneous and deep injections, easier injection, more even product distribution, reduced risk of needle clogging, decreased risk of papules and nodules, and creating a better overall result. Reconstitution should be at least 24 hours before injection (48 hours is better); the vial stored at room temperature for 24-48 hours, or kept refrigerated for up to 3-4 weeks prior to use.

Appropriate product placement and injection techniques are important for optimal results. PLLA is injected deep in the supraperiostal area, in zones presenting bony structure (maximum volume 0.3mL/cm^2), and subcutaneously in other areas (maximum volume 0.1mL/cm^2). Use a maximum of 1 vial per hemiface per session. Overcorrection should be avoided; reassessing further need for treatment no sooner than 4-6 weeks after the previous treatment. Volumetric result immediately after treatment gives a good idea of the definitive result. Use of a primed needle is recommended.

PLLA can be used successfully in the following areas: malar, cheeks, pre-auricular, prejowl sulcus, chin along the mandibular border, medial from the DAO muscle, deep to the DAO and mentalis muscles, submalar region of the zygomatic bone, nasolabial crease, recontouring of the lateral 1/3 of the mandible/mandibular angle, and mediojugal fold. PLLA should not be injected intra- or sub-dermally in areas with hyperdynamic musculature (ie, forehead wrinkles, frown lines, eyelids, crows feet, oral commissures, perioral rhytids and lips), or in the nose, hands, and neck.

PLLA can be administered using fanning and cross-hatching for subcutaneous injections, and depot for deep injections. For more technical details, refer to Tables 1 and 2.

Treatment of Side Effects

Papule and nodule formation decreased with our better experience of PLLA and highly evolved injection technique; the majority disappearing spontaneously within a year. If non-visible papules appear, it is recommended to wait for spontaneous resolution. If the patient feels uncomfortable, vigorous massage, with or without subcision may help (Table 3).

In rare instances where visible nodules or papules persist, they may be dissolved using intralesional injection of corticosteroids, or in selected cases surgical excision. However, after

TABLE 2.

European Expert Group Recommendations on the Preparation and Use of PLLA

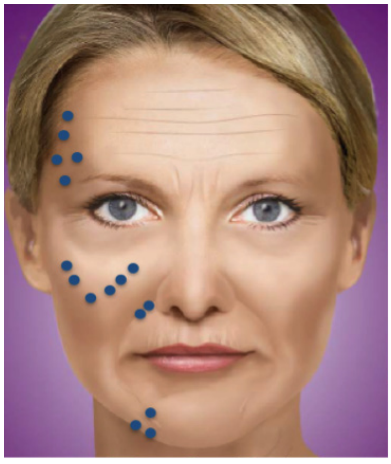
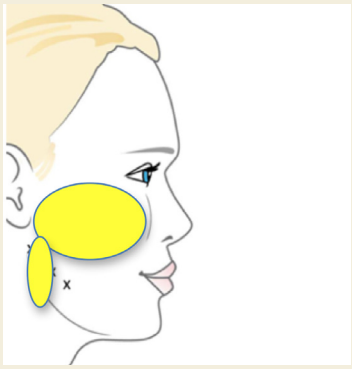
Key Stages in the Preparation and Use of PLLA	European Consensus Group Recommendations
Dilution, hydration and storage	**Dilution:** add 7mL sterile water for injection (SWFI). Clean the rubber stopper on the vial with antiseptic, take a sterile 10mL or 5mL syringe and 18G needle. Fill with 7mL of SWFI, introduce the 18G needle into the rubber stopper. The SWFI should be added slowly to the powder. Note that the total volume before injection will be 9mL (ie, 7mL SWFI and 2mL anaesthetic). **Hydration:** leave to hydrate at room temperature for at least 24 hours (48 hours is better) to ensure PLLA is fully hydrated. After adding SWFI, you can gently turn the vial upside down several times to ensure all the dry powder is in contact with the water. **Storage:** reconstituted PLLA can be stored at room temperature for 24-48 hours, or kept refrigerated for up to 3-4 weeks prior to use.
Preparation prior to use	Add 2mL of 1–2% lidocaine (with or without epinephrine) or mepivacaine immediately prior to injection to make a total volume of 9mL. Discuss the need for additional topical anesthesia with your patient. Roll the vial in the hands until a homogenous translucid suspension is obtained. Check if the bottom of the vial is clear of product in order to ensure all the PLLA is in suspension. Try not to shake too vigorously in order to avoid foaming. PLLA is ready to use.
Product injection	Vascular compromise, although rare, is one of the most severe adverse events. It can occur with all fillers and has also been reported in a very few cases of PLLA injections. Although there is no good evidence available on how to reduce the risk of vascular compromise, the experts agree that aspiration before injections, especially in the mid face and temple fossa, may decrease the risk of intravascular injections and should therefore be recommended. Clean the rubber stopper with chlorhexidine/alcohol. Use an 18G needle to withdraw the appropriate amount of suspension (1 or 3mL sterile single use luer lock syringe). Do not store the reconstituted PLLA in the syringe. Before injecting the product, change the 18G needle. Use a 25G/26G 1-1 ½ inch needle, or 25G/27G cannula to inject PLLA into the appropriate layer. Always prime the needle/cannula. • Subcutaneous (hypodermis) • Deep injection (close to the supraperiostal area) Discard any product remaining in the vial after each patient.
Product amount	How much PLLA to use is determined by the surface area to be treated at that session. • Subcutaneous injection (product spread on surface): 0.1mL/cm^2 • Deep injection (filling depressed areas): 0.3mL/cm^2. So for an area of 9cm^2 (ie, Temple) this represents 2.7mL or 1/3 vial (assuming 9mL dilution volume) For each session use a maximum of 1 vial per hemiface. **TREAT, WAIT, ASSESS**. Wait 4-6 weeks between treatments. Do not overcorrect. Reassess further need for treatment. The volumetric result immediately after treatment gives a good idea of the definitive result. Schedule sessions 4-6 weeks apart, depending on age of patient.
Product placement	 **Deep injection** in the temple area. • Typically use a multiple depot technique to cover the area (unless using a cannula subcutaneously when training is necessary) • Check length of needle (maximum 1.5") • 0.2-0.3mL/cm^2 • Always inject gently, close to the bone, perform a reflux maneuver and never forcing if you meet resistance • Firm massage **Deep injection** along zygoma, maxilla and mandible. • Supraperiostal , adjust the angle of injection (needle) depending on the anatomical area • 0.2-0.3mL/cm^2 • Firm massage

Table continued on next page

Key Stages in the Preparation and Use of PLLA	European Consensus Group Recommendations
Product placement	 **Subcutaneous injections** • Cross-hatching/fanning technique parallel to the skin • 0.1-0.3mL/cm^2 • Firm massage
Injection techniques	Favorable injection techniques allow slow, safe, uniform dispersion of PLLA at the proper depth for optimal cosmetic benefit. General considerations include: • Injection should be into the subcutaneous or supraperiosteal plane • Superficial injection (ie, into the dermis) should be avoided, as this may lead to visible neocollagenesis • A reflux maneuver should be performed routinely to eliminate any risk of inadvertent intravascular injection • Injection should be performed slowly without using excessive pressure Fanning (for subcutaneous and deep injection). The needle is inserted in a similar way to that used in the linear threading technique, but just before the needle is almost completely withdrawn, change its direction and inject a new line of PLLA. Depot: use a 25-26G needle, raise the tissue by taking it between the fingers with the hand that is not holding the syringe (passive hand) and introduce the needle decisively. Inject 0.1-0.3mL/cm^2 according to the treated area. Reinsert the needle for another depot injection. The depot technique is the easiest to learn and is very precise. Cross-hatching: use a 25G or 26G needle and inject under the dermis retrograde, with cross-hatching 0.1mL/point of injection.
How to avoid needle or cannula obstruction (clogging)	Reconstitute enough time in advance (at least 24 hours before injection, although most experts would suggest 48-72 hours is better). Manipulate/shake the syringe during injection, avoid foaming. Use PLLA quickly to avoid sedimentation of particles in the syringe. A 1-3mL luer lock syringe can be used. Regularly change needles.
What to do if the needle becomes blocked	Do not force. Withdraw the needle, pull the plunger back until the needle becomes free again. Re-inject. Inject with a primed needle (dripping needle). Use luer lock syringes. Note that with multiple sessions, the needle can become obstructed due to trying to inject into an area that has been previously treated.
Aftercare	Massage immediately after each application, at the end of the session and continued massage at home by the patient is extremely important. Massage each treated area for 1-2 minutes before continuing on to the next area to be treated. On completion of the session, provide intensive rotative, bi-digital intra oral massage for 5 minutes. Make the patient aware of his own responsibility for massaging the treated areas for 5 minutes twice a day for a week.

steroid injections volume loss in the fat surrounding the lesion can occur, making nodules more apparent. In these cases, they may be camouflaged by injecting hyaluronic acid (HA) into the perinodular area until they disappear.[65]

The term 'granuloma' has been often used incorrectly in reference to papules and nodules in the medical literature.[45,46,66] This has lead to both misunderstandings with the overall safety profile associated with the use of injectable products such as PLLA,

TABLE 3.

European Expert Group Recommendations for Combination Use With PLLA	
Combination with other aesthetic procedures	**European Expert Group Recommendations**
When PLLA is to be used as the foundation in combination in the same facial area	If two tissue-collagen stimulating methods are used (ie, PLLA, fractionated laser therapy or needling, medium depth or deep peels) the second treatment should be done 4–6 weeks before or after PLLA treatment. If no additional tissue-collagen stimulating treatments are used the time period can be shorter (ie, a vascular laser for the treatment of small vessels of the cheek can be done 1 week prior or after PLLA treatment of the cheek). Traditional ablative treatments such as CO_2 resurfacing should be spaced 3-4 months with a treatment with PLLA.
When PLLA is to be used as the foundation in combination to address different facial area	If two different areas are being treated, this can be done on the same day (ie, BoNT-A in the glabella area, hyaluronic acid for lip volume, and PLLA for the cheeks).

TABLE 4.

European Expert Group Treatment Recommendations on Treatment of Side Effects	
Nodules and Papules	**European Expert Group Recommendations**
Due to product accumulation* * more product than foreign body reaction	Wait and see attitude is recommended, especially if nonvisible. Spontaneous resolution can occur. Injection of saline in the papules and/or massage has been recommended, however, there is no published evidence for it is effectiveness!
Due to exaggerated response* * caused by immune response (foreign body granuloma)	Immunomodulatory treatment, oral steroids as pulse (ie, for 6 days of reducing steroid, prednisone 60, 60, 40, 40, 20, 20mg**), caution with injection of steroids (be aware of localized lipoatrophy***), injection of 5-FU. Injection of hyaluronic acid proximal to a lesion to camouflage its appearance until reabsorbed or otherwise treated. **dosage/day, repeated pulses might be necessary with intervals of 1 week or more ***might be treated with localized hyaluronic acid injections

and the incidence of granulomas. True inflammatory granulomas with injectable products are rare in clinical practice (0.01%-0.1%).[67,45] They can be addressed with injections of steroids and antimetabolites such as 5-FU, rarely recurring after treatment.[68]

Combination With Other Aesthetic Procedures

Effective tissue augmentation often requires a combination approach to achieve natural facial aesthetic balance. PLLA can be used as the foundation for other treatments (ie, surgical face lift, HA, botulinum toxin, chemical peels, radio-frequency, microdermabrasion, micro-needling, laser re-surfacing and topical skin products).[69] Patients seeking immediate improvement may benefit from augmentation in combination with HA.[69]

Topical cosmetics can be used immediately after PLLA sessions. Topical medications such as retinoids, and microdermabrasion or superficial peels can be resumed/used within a few days. Recommendations for combination therapies depend on the type of intervention and the area treated (Table 4).

Optimal Use of PLLA for Facial Rejuvenation: Expert Recommendations on Patient Selection and Treatment Follow-Up

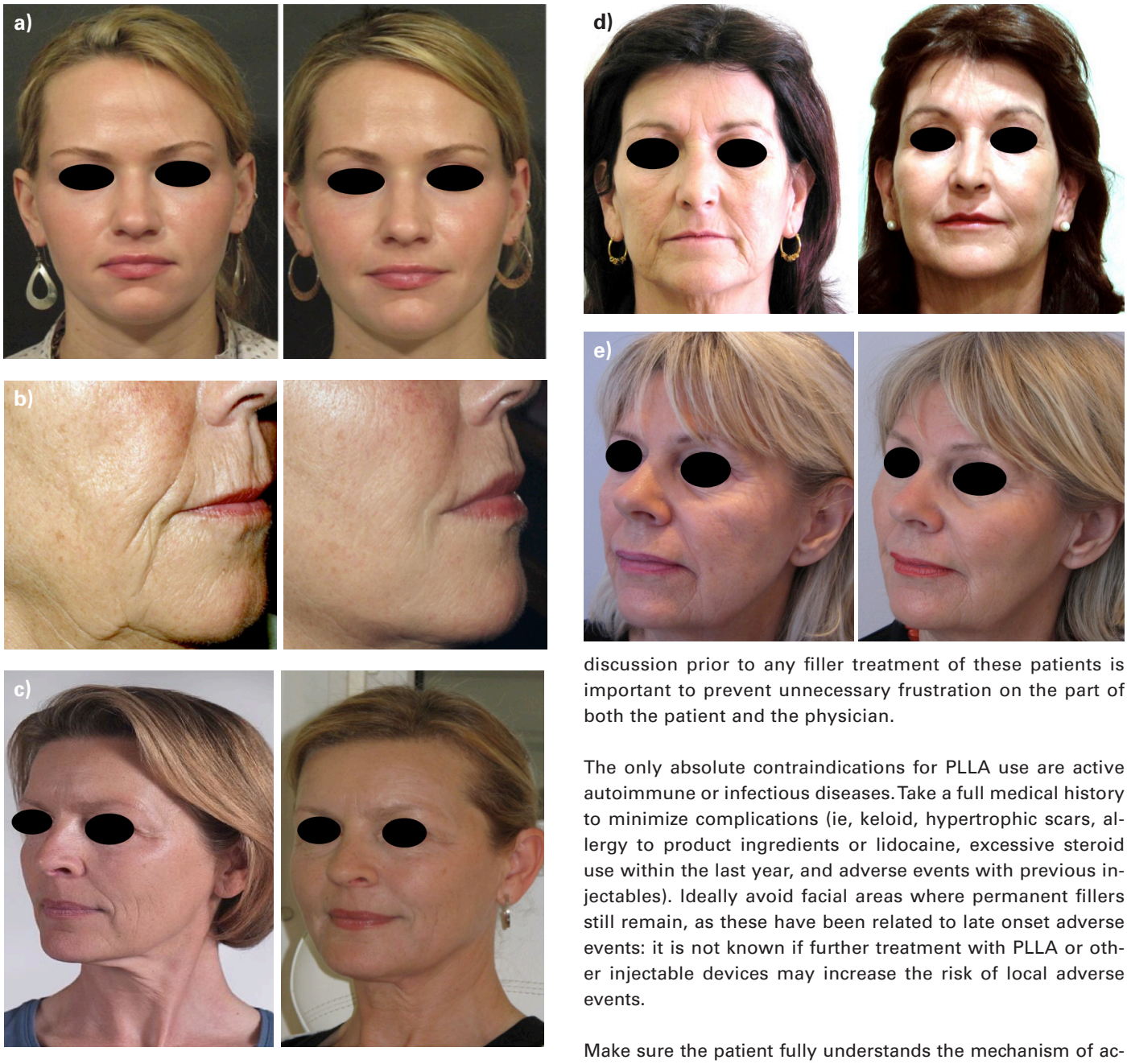
PLLA is injected deep subcutaneous or on the periosteum where it stimulates fibroblasts to produce new collagen. Initial increases in facial volume due to diluent volume gradually disappear in a few days. Volume restoration and new collagen production is progressive, normally seen 2-3 months after treatment. New collagen growth continues over the next few months. Patients will commonly notice improvements in skin surface and radiance. The amount of surface area to be treated is the sole determinant of the amount of PLLA used during a session. The vast majority (~98%) of patients should receive 1-2 vials per session if treating the whole face (0.5–1 vial per side). Usually 2-3 treatment sessions, at least 4-6 weeks apart are required. The final number of sessions depends on age and facial volume loss.

Patient Selection and Assessment

PLLA is suitable for all patient types; especially patients suffering important volume loss. Patients in their 30s are usually treated for premature facial volume loss (ie, illness, steroid abuse, diet, genetics); 35-40s for prevention of first aging signs, and those older for soft tissue aging and related bone loss. Clinical cases are shown in Figure 2.

To assess volume loss and guide treatment, patients should bring pictures showing themselves 10-15 years younger. The face should be observed with appropriate lighting at every angle, non-animated and smiling (cheeks can appear over-large when smiling if too much PLLA is used). Determine skin elasticity and

FIGURE 2. Clinical cases **a-e)**.



recoil; assess volume loss through deep palpation. Demonstrate the effects of filling the temples, mid-face, and cheeks. Draw on the face and show where volume loss will be treated with PLLA using a mirror. Take pre-treatment photographs (straight on and 45° turned) to show cheek and temple loss.

Experience has shown that patients with very empty faces, or those with a very elastic outer skin envelope may be challenging to volumize, requiring substantial amounts of whatever product to achieve the desired result. An open discussion prior to any filler treatment of these patients is important to prevent unnecessary frustration on the part of both the patient and the physician.

The only absolute contraindications for PLLA use are active autoimmune or infectious diseases. Take a full medical history to minimize complications (ie, keloid, hypertrophic scars, allergy to product ingredients or lidocaine, excessive steroid use within the last year, and adverse events with previous injectables). Ideally avoid facial areas where permanent fillers still remain, as these have been related to late onset adverse events: it is not known if further treatment with PLLA or other injectable devices may increase the risk of local adverse events.

Make sure the patient fully understands the mechanism of action and clinical effects of PLLA treatment. Common questions are listed in Table 5. Discuss concerns, possible complications (ie, papules), and their management. Provide a written quotation giving sufficient time for the patient to make their decision on cost and alternative treatment plans. A signed patient informed consent should be obtained before treatment.

Post-Treatment Care

Good post-treatment care to prevent nodule/papule formation and maximize collagen growth is important. Although data to

TABLE 5.

Questions Patients Ask: Practical Advice and Expert Guidance	
Question	**Expert Guidance**
Why do you recommend PLLA instead of a dermal filler?	PLLA meets the increasing patient need for a discrete full-face treatment. PLLA is more cost effective long term, with more volume lift achievable per vial of product used. The effect of PLLA will last longer at least up to 25 months and the results achieved will generally be softer and more natural looking in both static and dynamic facial positions. Results are also gradual and less sudden.
Can patients expect immediate results?	It is very important to explain to patients that PLLA does not give immediate results, other than the initial, transient diluent effect. If a patient also wants immediate results in certain areas (ie, nasolabial folds), a small amount of hyaluronic acid can be administered during the same session (after the PLLA) or soon after their PLLA treatment. Patients can also be treated with botulinum toxin to soften their dynamic facial lines.
What sort of results might patients expect?	All patients should respond well to PLLA, although new collagen growth can vary between patients and depends on their age, initial volume loss, smoking and sun exposure habits. The improvement seen is gradual and appears very natural. It is important that patients realize that new collagen takes time to grow and that they will achieve their final results in a gradual, natural manner in the course of a few months.
How long will the results last?	PLLA can provide long-lasting results up to 25 months. The longevity of results with PLLA may be affected by excessive sun exposure and smoking as these may cause premature breakdown of the new collagen. Weight loss also affects results as this may cause fat loss from the face and will alter the facial volume.
How much will it cost?	The correct estimation of the number of vials of PLLA is a very important aspect of the initial consultation. A helpful way of estimating the total need of PLLA administered over several treatments for a full face correction is approximately one vial per decade (5 vials total for a 50-year-old patient). The number of vials per single treatment will depend on the total surface that has been treated, patient's age and degree of presenting facial volume loss. In general we try to limit the amount to 2 vials per treatment (ie, 5 vials in total for a 50-year-old patient, divided over 3 treatments, 2-2-1 vials). Take into account the patient's available budget. If the patient only has a small budget then it is best to guide them in prioritizing initial areas of treatment.

support post-treatment massage are limited, massaging the injected area for a few minutes after treatment is recommended. Continued patient self-massage (5 minutes twice daily for a week) may be left to the discretion of the treating physician.

The massaged areas may feel tender for the first few days. Simple analgesia is allowed, unless contraindicated, but usually not necessary. Ice can be used short-term, but overuse can cause rebound vasodilation. Excessive alcohol and exercise should be avoided for the first 24 hours, and sun exposure limited until any initial swelling and redness resolves.

Treatment Follow-Up

Patients should be seen during the year to review post-treatment photographs (same lighting, background and make-up), assess volume correction and symmetry, and discuss further treatment needs. Any re-stimulation after two years usually only requires 30%-50% of the initial PLLA amount.

CONCLUSION

PLLA (Sculptra®, Sinclair Pharmaceuticals) is an effective collagen stimulator that restructures the face and gradually restores volume, returning a healthier, youthful appearance. It is simple to use and provides long-lasting effects and high patient satisfaction. PLLA is one of the most wildly documented treatments. Over the last 14 years, our experience with PLLA has evolved considerably and contributed to its safe and effective use. We have come to understand major technical aspects, the importance of patient selection and counseling, and how to improve safety profile and combine PLLA with other treatment options. It is expected our recommendations provide a helpful platform to appreciate PLLA's unique properties and optimal use, achieving both gradual and natural-looking results, with heightened patient satisfaction.

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DISCLOSURES

Drs. Redaelli, Rzany, Eve, Grangier, Herranz, Olivier-Masveyraud, and Vleggaar are all members of the European Sculptra Expert Board and consultants to Sinclair Pharmaceuticals.

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